# Using the Tables in This Book

> ## KEY TEACHING POINTS
>
> - **Frequency of findings** tables present only the sensitivity of findings (derived from studies of large numbers of patients with a confirmed diagnosis). In these tables, only those findings with *high* sensitivity are clinically useful: if these key findings are *absent* in symptomatic patients, diagnosis of disease is *unlikely.*
> - **EBM Boxes,** derived from large numbers of patients presenting with similar symptoms but different final diagnoses, quickly convey to clinicians which physical signs are most accurate for a particular diagnosis. Those findings with likelihood ratios (LRs) having the greatest value *increase* the probability of disease the most (i.e., LRs function like diagnostic weights). Those findings with LRs closest to the value of 0 *decrease* the probability of disease the most.

## I. INTRODUCTION

Information about the diagnostic accuracy of physical findings is presented in two types of tables in this book: (1) "frequency of findings" tables, which display only the sensitivity of physical signs, and (2) evidence-based medicine (EBM) boxes, or "diagnostic accuracy" tables, which present the sensitivity, specificity, and LRs of various physical signs.

## II. FREQUENCY OF FINDINGS TABLES

### A. DEFINITION

Frequency of findings tables summarize multiple studies of patients with a specific diagnosis and present the sensitivity of physical signs found in that disorder. These tables provide no information about a sign's specificity. An example is Table 3.1, listing the frequency of findings in constrictive pericarditis, a disorder in which a diseased and unyielding pericardium interferes with diastolic filling of the heart.

### B. PARTS OF THE TABLE
#### 1. FINDING

The first column lists the various physical signs, organized by organ system, with the findings of each organ system listed from most to least frequent.

#### 2. FREQUENCY

The second column lists the sensitivity (or frequency) of the physical signs. If the sensitivity from every study is statistically similar, the overall mean frequency is presented (e.g., in Table 3.1, 70% of patients with constrictive pericarditis have edema). If the sensitivities from the different studies are statistically diverse

| TABLE 3.1    Constrictive Pericarditis* | |
|---|---|
| **Physical Finding** | **Frequency (%)** |
| **NECK VEINS** | |
| Elevated neck veins | 95 |
| Prominent *y* descent (Friedreich's sign) | 57-100 |
| Kussmaul sign | 21-50 |
| **ARTERIAL PULSE** | |
| Irregularly irregular (atrial fibrillation) | 36-70 |
| **BLOOD PRESSURE** | |
| Pulsus paradoxus >10 mm Hg | 17-43 |
| **AUSCULTATION OF HEART** | |
| Pericardial knock | 28-94 |
| Pericardial rub | 3-16 |
| **OTHER** | |
| Hepatomegaly | 53-100 |
| Edema | 70 |
| Ascites | 37-89 |

*Diagnostic standard: For *constrictive pericarditis*, surgical and postmortem findings,[1-5] sometimes in combination with hemodynamic findings.[6-10]
†Results are overall mean frequency or, if statistically heterogeneous, the range of values.
Data from 282 patients based upon references 1-10.

(*p* <0.05 by the chi-squared test), the range of values is instead presented (e.g., in Table 3.1, 28% to 94% have a pericardial knock—a loud heart sound heard near the apex during early diastole).

## 3. FOOTNOTES
The footnotes to these tables present the source of the information and the diagnostic standards used. For example, the information in Table 3.1 is based on 282 patients from 10 different studies that based the diagnosis of constrictive pericarditis on surgical, postmortem, or hemodynamic findings.

## C. INTERPRETATION
Because the frequency of findings tables only provide information about a sign's sensitivity, they can only be used to support a statement that a physical sign, when *absent*, argues *against* disease. The absence of any finding whose sensitivity (or frequency) is greater than 95% is a compelling argument against that diagnosis (i.e., the negative LR is 0.1 or less, even if the specificity of the finding, which is unknown, is as low as 50%). In Table 3.1, elevated venous pressure is such a finding (sensitivity = 95%): if the clinician is considering the diagnosis of constrictive pericarditis but the patient's bedside estimate of venous pressure is normal, the diagnosis is unlikely.

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*This statement assumes that the product of the LRs being combined is less than 0.1. Therefore,

$$LR^n = \left[ \frac{(1 - \text{sens})}{(\text{spec})} \right]^n \leq 0.1$$ where $n$ is the number of findings being combined. If the specificity

of the findings is as low as 50%, each of 2 findings being combined must have a sensitivity greater than 84%, and each of 3 findings being combined must have a sensitivity greater than 77%.

Similarly, the absence of two or three independent findings having sensitivities greater than 80% is also a compelling argument against disease* (see Chapter 2 for a definition of *independent findings*).

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# III. DIAGNOSTIC ACCURACY TABLES (EBM BOXES)

## A. DEFINITION

Diagnostic accuracy tables summarize information from large numbers of patients who present with similar symptoms but different diagnoses. These EBM Boxes present the physical sign's sensitivity, specificity, and positive and negative LRs, which then indicate how well that physical sign discriminates between patients with a particular diagnosis of interest and those without it.

EBM Box 3.1 presents an example summarizing the diagnostic accuracy of physical signs for pneumonia, as applied to a large number of patients with cough and fever (see Chapter 32 for the complete EBM Box). In these studies, only about 20% of patients had pneumonia; the remainder had other causes of cough and fever, such as sinusitis, bronchitis, or rhinitis.

## B. PARTS OF THE EBM BOX
### 1. FINDING

The first column presents the physical signs, organized by organ system, and the source of the information. Validated scoring schemes that combine findings appear in the bottom rows of EBM Boxes.

### 2. SENSITIVITY AND SPECIFICITY

The second and third columns present the range of a physical sign's sensitivity and specificity observed in these studies.

### 3. LIKELIHOOD RATIOS

The fourth and fifth columns present the physical sign's positive and negative LR (for clarity, "likelihood ratio if finding *present*" refers to the positive LR, and "likelihood ratio if finding *absent*" refers to the negative LR). In contrast to sensitivity and specificity, which are presented as a range of values, LRs are described by a single number, derived by using a statistical technique called the random effects model (see the section on Summarizing LRs in this chapter).[21] Only statistically significant LRs are presented in the EBM Boxes. If the 95% confidence interval (CI) for an LR, positive or negative, includes the value of 1, that result of the physical finding fails to statistically discriminate between patients with disease and those without it, and the notation "NS" (for "not significant") is recorded in the EBM Box.

### 4. FOOTNOTE

The footnotes to EBM Boxes describe the diagnostic standards used in the studies and, if necessary, definitions of findings. The footnote for EBM Box 3.1, for example, indicates that the diagnostic standard for pneumonia was the chest radiograph; it also describes the components of the Heckerling diagnostic scoring scheme presented in the bottom rows of the EBM Box.

### EBM BOX 3.1
*Pneumonia**

| Finding (Reference)[†] | Sensitivity (%) | Specificity (%) | Likelihood Ratio[‡] if Finding Is | |
|---|---|---|---|---|
| | | | *Present* | *Absent* |
| **General Appearance** | | | | |
| Cachexia[11] | 10 | 97 | **4.0** | NS |
| Abnormal mental status[12-14] | 12-14 | 92-95 | 1.9 | NS |
| **Lung Findings** | | | | |
| Percussion dullness[11-13,15,16] | 4-26 | 82-99 | **3.0** | NS |
| Diminished breath sounds[12,13,15-18] | 7-49 | 73-98 | 2.2 | 0.8 |
| Bronchial breath sounds[12] | 14 | 96 | **3.3** | NS |
| Egophony[11-13] | 4-16 | 96-99 | **4.1** | NS |
| Crackles[11-19] | 19-67 | 36-96 | 2.3 | 0.8 |
| Wheezing[12-17,19] | 10-36 | 50-86 | 0.8 | NS |
| **Diagnostic Score (Heckerling et al.)[12,20]** | | | | |
| 0 or 1 findings | 7-29 | 33-65 | **0.3** | – |
| 2 or 3 findings | 48-55 | – | NS | – |
| 4 or 5 findings | 38-41 | 92-97 | **8.2** | – |

* Diagnostic standard: For *pneumonia*, infiltrate on chest radiograph.
†Definition of findings: For *Heckerling diagnostic score*, the clinician scores 1 point for each of the following five findings that are present: temperature greater than 37.8° C, heart rate greater than 100/min, crackles, diminished breath sounds, and *absence* of asthma.
‡Likelihood ratio (LR) if finding present = positive LR; LR if finding absent = negative LR.
*NS*, Not significant.
Click here to access calculator

**PNEUMONIA**
Probability
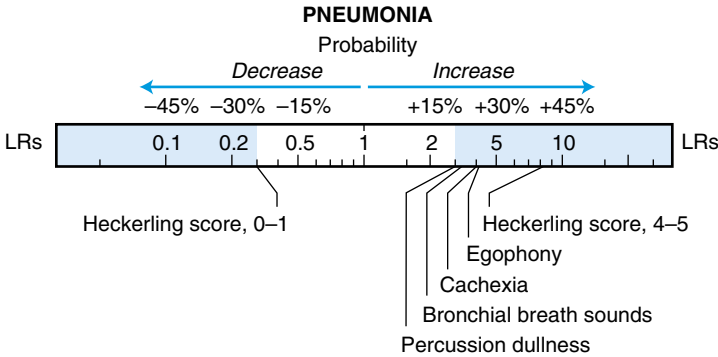
## C. INTERPRETATION OF EBM BOXES

To use these EBM Boxes, the clinician needs to simply glance at the LR columns to appreciate the discriminatory power of different findings. LRs with the greatest value increase the probability of disease the most; LRs with the value closest to zero decrease the probability of disease the most. Boldface type highlights all findings with an LR of 3 or more or of 0.3 or less, thus allowing quick identification of those physical signs that increase probability more than 20% to 25% (LR ≥3) and those that decrease it more that 20% to 25% (LR ≤0.3; see also Chapter 2).

In patients with cough and fever (see EBM Box 3.1), the individual findings increasing probability of pneumonia the most are egophony (LR = 4.1), cachexia (LR = 4), bronchial breath sounds (LR = 3.3), and percussion dullness (LR = 3). In contrast, no *individual* finding in this EBM Box, whether present or absent, significantly *decreases* the probability of pneumonia. (No LR has a value ≤0.3.)

EBM Box 3.1 also shows that four or more points using the Heckerling diagnostic scheme significantly *increases* the probability of pneumonia (LR = 8.2), whereas the presence of 0 or 1 point significantly *decreases* it (LR = 0.3).

# IV. CRITERIA FOR SELECTING STUDIES USED IN DIAGNOSTIC ACCURACY TABLES

All studies of adult patients that meet the following four criteria are included in the EBM Boxes of this book.

## A. PATIENTS WERE SYMPTOMATIC

The study must have enrolled patients presenting to clinicians with symptoms or other problems. Therefore, studies using asymptomatic controls, which tend to inflate the specificity of physical signs, have been excluded. Clinicians do not need a physical sign to help them distinguish patients with pneumonia from healthy persons (who would not be consulting the doctor); instead, they are interested in those physical signs distinguishing pneumonia from other causes of cough and fever.

## B. DEFINITION OF PHYSICAL SIGN

The physical sign must be clearly defined in the study.

## C. INDEPENDENT COMPARISON TO A DIAGNOSTIC STANDARD

There must be an independent comparison to an acceptable diagnostic standard. *Independent comparison* means that the physical sign was not used to select patients for testing with the diagnostic standard. Acceptable diagnostic standards include laboratory testing, clinical imaging, surgical findings, or postmortem analysis.

## D. 2 × 2 TABLE COULD BE CONSTRUCTED

The studies must provide figures or tables from which numbers could be extracted to construct 2 × 2 tables and calculate sensitivity, specificity, and LRs. If any cell of the 2 × 2 table contained a value of zero, 0.5 was added to all cells to avoid creating the unlikely LRs of 0 or infinity.

# V. SUMMARIZING LIKELIHOOD RATIOS

The random effects model by Dersimonian & Laird,[21] which considers both within study and between study variance to calculate a pooled LR, was used to summarize

| TABLE 3.2 | Egophony and Pneumonia—Individual Studies | | | |
|---|---|---|---|---|
| Reference | Sensitivity (%) | Specificity (%) | Positive Likelihood Ratio (95% CI) | Negative Likelihood Ratio (95% CI) |
| Heckerling[12] | 16 | 97 | 4.91 (2.88, 8.37) | 0.87 (0.81, 0.94) |
| Gennis[13] | 8 | 96 | 2.07 (0.79, 5.41) | 0.96 (0.90, 1.02) |
| Diehr[11] | 4 | 99 | 7.97 (1.77, 35.91) | 0.96 (0.91, 1.02) |
| Pooled result | | | 4.08 (2.14, 7.79) | 0.93 (0.88, 1.01) |
| Notation used in book | 4-16 | 96-99 | 4.1 | NS |

*NS*, Not significant.

the LRs from the various studies. Table 3.2 illustrates how this model works. In the top rows of this table are the individual data from all studies of egophony that appear in EBM Box 3.1, including the finding's sensitivity, specificity, the positive and negative LRs, and the LRs' 95% CIs. The bottom row of Table 3.2 shows how all this information is summarized throughout the book.

In each of the studies, egophony is specific (96% to 99%) but not sensitive (4% to 16%). The positive LRs are all greater than 1, indicating that the finding of egophony increases the probability of pneumonia. For one of the three studies (i.e., Gennis and others[13]), the positive LR lacks statistical significance because its 95% CI includes the value of 1 (i.e., a LR value of 1 has no discriminatory value). For the other two studies, the 95% CI of the positive LR excludes the value of 1, thus making them statistically significant. The summary measure for the positive LR (fourth row of this table) is both clinically significant (4.08, a large positive number) and statistically significant (its 95% CI excludes 1.0). All of this information is summarized in the notation used in this book (last row) by simply presenting the pooled LR of 4.1. (Interested readers may consult the Appendix for the 95% CIs of all LRs in this book.)

In contrast, the negative LRs from each study have both meager clinical significance (i.e., 0.87 to 0.96, values close to 1) and, for two of the three studies, no statistical significance (i.e., the 95% CI includes 1). The pooled negative LR also lacks clinical and statistical significance. Because it is statistically no different from 1.0 (i.e., the 95% CI of the pooled value, 0.88 to 1.01, includes 1), it is summarized using the notation "NS" for "not significant."

Presenting the single pooled result for statistically significant LRs and NS for the statistically insignificant ones simplifies the EBM Boxes and makes it much simpler to grasp the point that the finding of egophony in patients with cough and fever increases probability of pneumonia (LR = 4.1) but the absence of egophony affects probability very little or not at all.

*The references for this chapter can be found on* *www.expertconsult.com.*

# REFERENCES

1. Evans W, Jackson F. Constrictive pericarditis. *Br Heart J*. 1952;14:53–69.
2. Lange RL, Botticelli JT, Tsagaris TJ, Walker JA, Bani M, Bustamante RA. Diagnostic signs in compressive cardiac disorders: constrictive pericarditis, pericardial effusion, and tamponade. *Circulation*. 1966;33:763–777.
3. Paul O, Castleman B, White PD. Chronic constrictive pericarditis: a study of 53 cases. *Am J Med Sci*. 1948;216:361–377.
4. Mounsey P. The early diastolic sound of constrictive pericarditis. *Br Heart J*. 1955;17:143–152.
5. Ling LH, Oh JK, Schaff HV, et al. Constrictive pericarditis in the modern era: evolving clinical spectrum and impact on outcome after pericardiectomy. *Circulation*. 1999;1000:1380–1386.
6. Tyberg TI, Goodyer AVN, Langou RA. Genesis of pericardial knock in constrictive pericarditis. *Am J Cardiol*. 1980;46:570–575.
7. Schiavone WA. The changing etiology of constrictive pericarditis in a large referral center. *Am J Cardiol*. 1986;58:373–375.
8. Wood P. Chronic constrictive pericarditis. *Am J Cardiol*. 1961;7:48–61.
9. El-Sherif A, El-Said G. Jugular, hepatic, and praecordial pulsations in constrictive pericarditis. *Br Heart J*. 1971;33:305–312.
10. Talreja DR, Edwards WD, Danielson GK, et al. Constrictive pericarditis in 26 patients with histologically normal pericardial thickness. *Circulation*. 2003;108:1852–1857.
11. Diehr P, Wood RW, Bushyhead J, Krueger L, Wolcott B, Tompkins RK. Prediction of pneumonia in outpatients with acute cough—a statistical approach. *J Chronic Dis*. 1984;37(3):215–225.
12. Heckerling PS, Tape TG, Wigton RS, et al. Clinical prediction rule for pulmonary infiltrates. *Ann Intern Med*. 1990;113:664–670.
13. Gennis P, Gallagher J, Falvo C, Baker S, Than W. Clinical criteria for the detection of pneumonia in adults: guidelines for ordering chest roentgenograms in the emergency department. *J Emerg Med*. 1989;7:263–268.
14. Mehr DR, Binder EF, Kruse RL, Zweig SC, Madsen RW, D'Agostino RB. Clinical findings associated with radiographic pneumonia in nursing home residents. *J Fam Pract*. 2001;50(11):931–937.
15. Melbye H, Straume B, Aasebo U, Dale K. Diagnosis of pneumonia in adults in general practice. *Scand J Prim Health Care*. 1992;10:226–233.
16. Melbye H, Straume B, Aasebo U, Brox J. The diagnosis of adult pneumonia in general practice. *Scand J Prim Health Care*. 1988;6:111–117.
17. Nakanishi M, Yoshida Y, Takeda N, et al. Significance of the progression of respiratory symptoms for predicting community-acquired pneumonia in general practice. *Respirology*. 2010;15:969–974.
18. van Vugt SF, Broekhuizen BDL, Lammens C, et al. Use of serum C reactive protein and procalcitonin concentrations in addition to symptoms and signs to predict pneumonia in patients presenting to primary care with acute cough: diagnostic study. *Br Med J*. 2013;346:f2540.
19. Singal BM, Hedges JR, Radack KL. Decision rules and clinical prediction of pneumonia: evaluation of low-yield criteria. *Ann Emerg Med*. 1989;18(1):13–20.
20. Emerman CL, Dawson N, Speroff T, et al. Comparison of physician judgment and decision aids for ordering chest radiographs for pneumonia in outpatients. *Ann Emerg Med*. 1991;20(11):1215–1219.
21. DerSimonian R, Laird N. Meta analysis in clinical trials. *Control Clin Trials*. 1986;7:177–188.